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- (54) **SIGNAL INPUT SWITCHING CIRCUIT,
METHOD OF CONTROLLING SIGNAL
INPUT SWITCHING CIRCUIT, AND
DISPLAY DEVICE**

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(2013.01)

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- (57) **ABSTRACT**

A signal input switching circuit (19) that reduces the occurrence of malfunctions arising due to crosstalk between switch circuits has a plurality of input terminals to which signals are applied as input from signal sources and further includes: a plurality of switch circuits (15 and 16) that supply signals received as input by way of any of the input terminals that was selected from among the plurality of input terminals; input control units (18) that are provided corresponding to each of the plurality of input terminals belonging to each of the plurality of switch circuits (15 and 16) and that control input of signals from signal sources by way of corresponding input terminals; an input acceptance unit (17) that accepts operation input; and a CPU (12) that, in accordance with input to the input acceptance unit (17), causes each switch circuit to select any of the plurality of input terminals belonging to that switch circuit and supply the signal that was received by way of the selected input terminal, and further causes input control units (18) corresponding to input terminals that were not selected to not supply signals from signal sources connected to the corresponding input terminals.

15 Claims, 3 Drawing Sheets

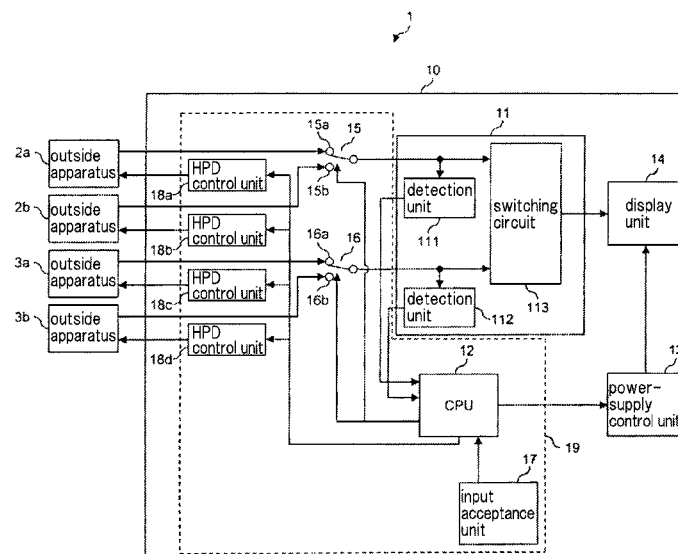


Fig. 1

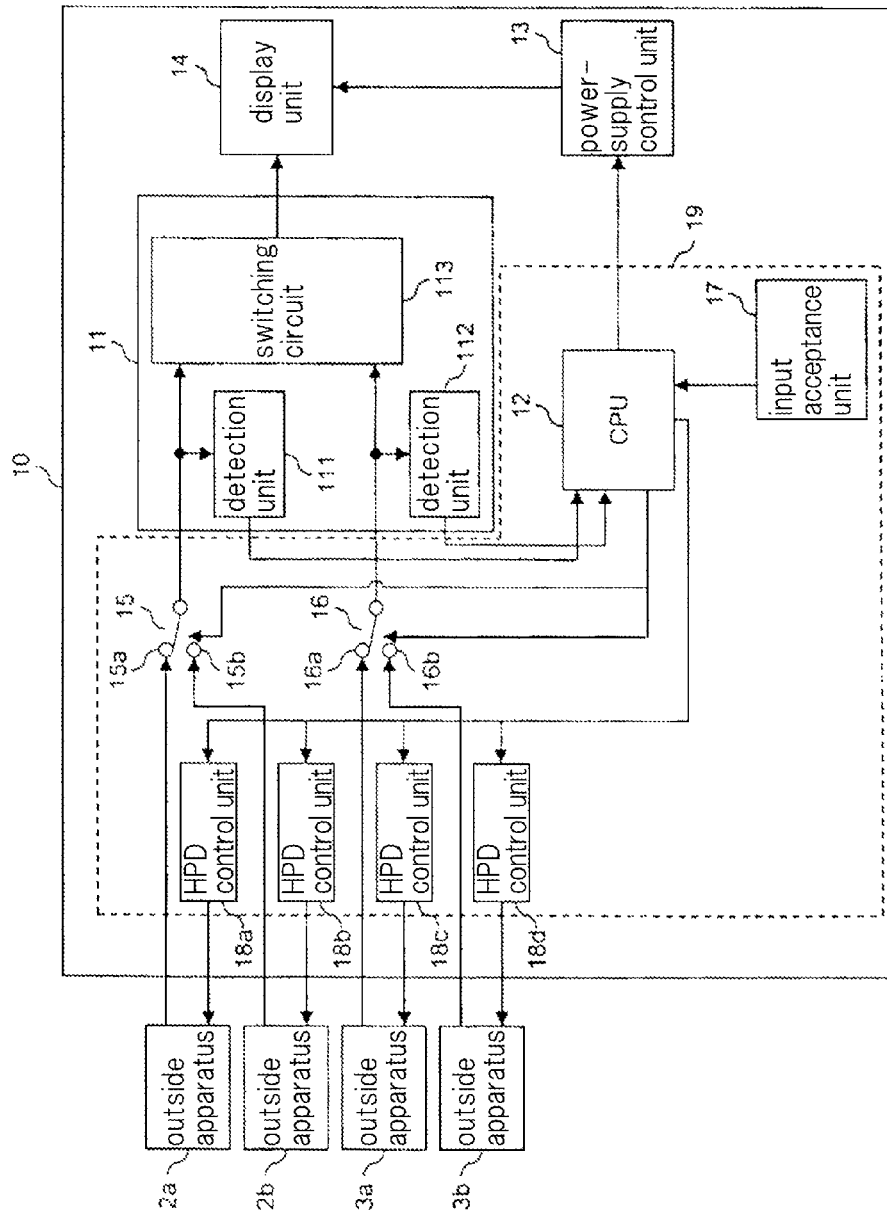


Fig.2

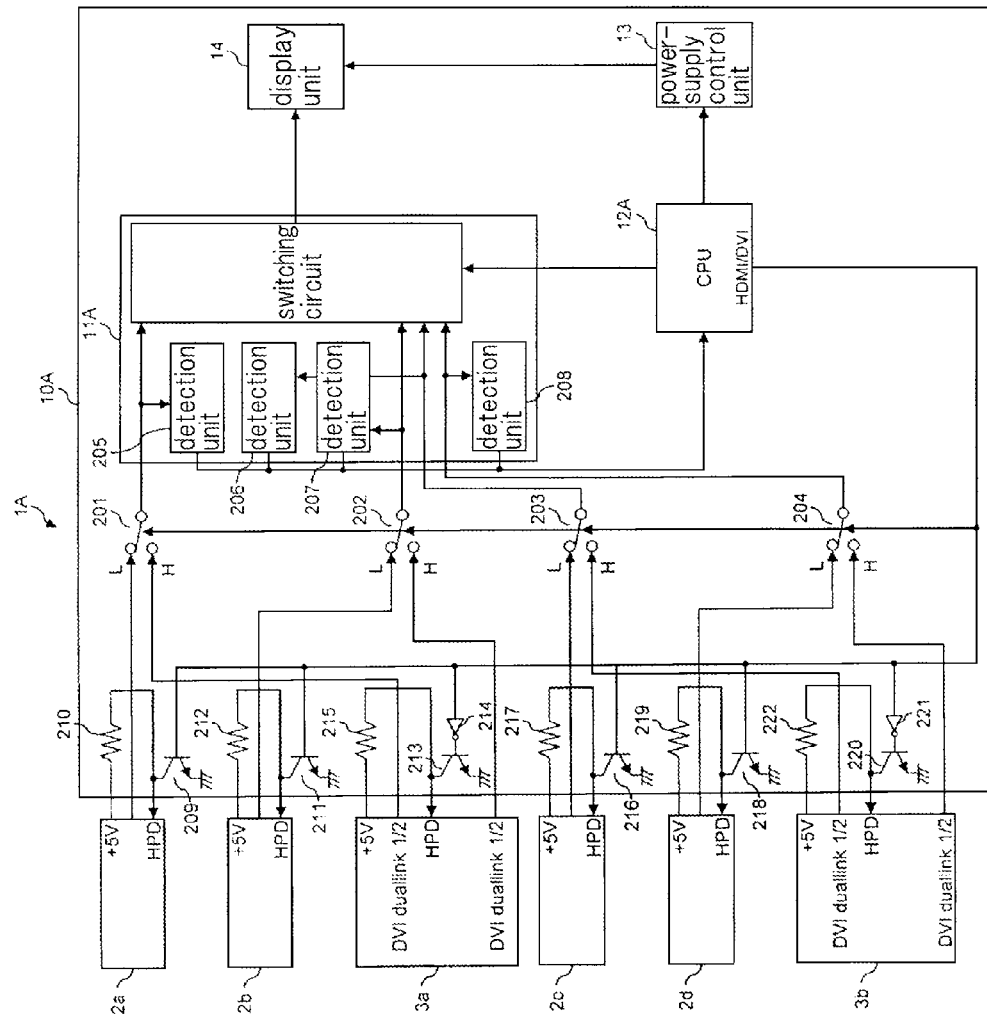
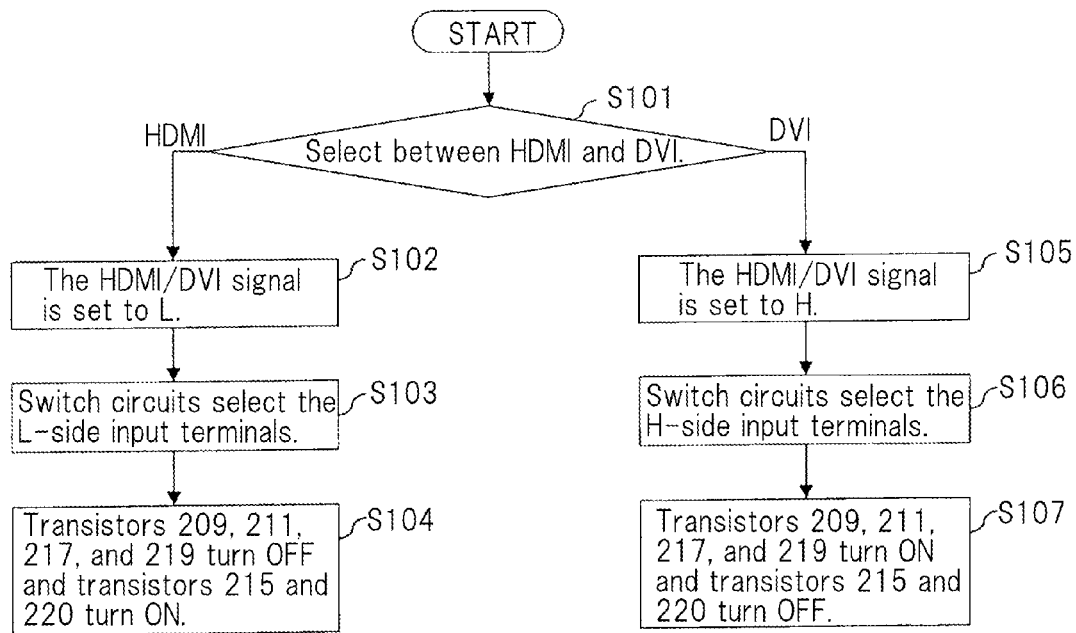


Fig.3



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SIGNAL INPUT SWITCHING CIRCUIT, METHOD OF CONTROLLING SIGNAL INPUT SWITCHING CIRCUIT, AND DISPLAY DEVICE

This application is based upon and claims the benefit of priority from Japanese patent application No. 2014-214276, filed on Oct. 21, 2014, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a signal input switching circuit, a method of controlling the signal input switching circuit, and a display device.

2. Description of the Related Art

There are display systems in which a display device such as a projector is connected to an outside apparatus such as a personal computer by way of a cable, a picture signal is applied as input to the display device from the outside apparatus, and a picture is then displayed on the display device (for example, refer to Japanese Unexamined Patent Application Publication No. 2013-258451).

SUMMARY OF THE INVENTION

The above-described display system includes a configuration in which a plurality of outside apparatuses are connected to the display device, and pictures that accord with picture signals that are applied as input from each of the plurality of outside apparatuses are switched and displayed in accordance with the operation of a user.

When a large number of outside apparatuses are connected to the display device, a switch circuit is used to perform switching of the pictures. However, in this case, malfunctioning may occur due to crosstalk of the switch circuit. For example, even though there is actually no input of a signal by way of an input terminal on the selected side in the switch circuit, the input of a signal by way of the input terminal on the selected side may be erroneously detected in a detection unit according to the input of a signal on the non-selected side.

It is an object of the present invention to provide a signal input switching circuit, a method of controlling the signal input switching circuit, and a display device that can reduce the occurrence of malfunctioning that arises due to switch circuit crosstalk.

The signal input switching circuit of the present invention for realizing the above-described object includes:

a plurality of switch circuits each having a plurality of input terminals to which signals are applied as input from signal sources and each supplying as output a signal that was applied as input by way of any of the input terminals that was selected from among the plurality of input terminals;

input control units that are provided corresponding to each of the plurality of input terminals belonging to each of the plurality of switch circuits and that control the input of signals from the signal sources by way of the corresponding input terminals;

an input acceptance unit that accepts operation input; and

a control unit that, in accordance with input to the input acceptance unit, causes each of said switch circuits to select any of the plurality of input terminals belonging to that switch circuit and supply as output a signal that is received as input by way of the selected input terminal, and further, causes input control units corresponding to input terminals

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that were not selected to not supply signals from signal sources that are connected to the corresponding input terminals.

The method of controlling the signal input switching circuit of the present invention for achieving the above-described object is a control method of a signal input switching circuit in which the signal input switching circuit is provided with:

a plurality of switch circuits each having a plurality of input terminals to which signals are applied as input from signal sources by way of predetermined cables and each supplying as output a signal that was applied as input by way of any input terminal that was selected from among the plurality of input terminals;

input control units that are provided corresponding to each of the plurality of input terminals belonging to each of the plurality of switch circuits and that control the input of signals from signal sources by way of corresponding input terminals; and

an input acceptance unit that accepts operation input;

the control method including steps of, in accordance with input to the input acceptance unit, causing each of the switch circuits to select any of the plurality of input terminals and supply as output the signal that was received as input by way of the selected input terminal, and further, causing input control units corresponding to input terminals that were not selected to not supply as output signals from signal sources that are connected to the corresponding input terminals.

The display device of the present invention for realizing the above-described object includes:

the above-described signal input switching circuit; switching circuits that supply as output any of signals that were supplied from each of the plurality of switch circuits; and

a display unit;

wherein the signals are picture signals; and

the display unit displays pictures in accordance with the picture signals that were supplied from the switching circuits.

The present invention enables reducing of the occurrence of malfunctioning that arises from crosstalk of switch circuits.

The above and other objects, features, and advantages of the present invention will become apparent from the following description with reference to the accompanying drawing, which illustrate examples of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the configuration of the display system according to the first exemplary embodiment of the present invention.

FIG. 2 shows the configuration of the display system according to the second exemplary embodiment of the present invention.

FIG. 3 is a flow chart showing the operation of the display device shown in FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Exemplary embodiments of the present invention are next described with reference to the accompanying drawings.

First Exemplary Embodiment

FIG. 1 shows the configuration of display system 1 according to the first exemplary embodiment of the present invention.

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Display system **1** shown in FIG. **1** includes outside apparatuses **2a**, **2b**, **3a**, and **3b** and display device **10**.

Outside apparatuses **2a**, **2b**, **3a**, and **3b** are connected to display device **10** by way of cables and are the signal sources that supply picture signals to display device **10**. When an outside apparatus is connected to display device **10**, a process referred to as "HPD" (Hot Plug Detect) is carried out between the outside apparatus and display device **10**, and the connection with display device **10** is detected in the outside apparatus. More specifically, a data line that is used for transmitting picture signals and an HPD line that is used in HPD are typically included in the cable that connects the outside apparatus and display device **10**. When an outside apparatus and display device **10** are connected, a predetermined signal is transmitted from the outside apparatus to display device **10** by way of the data line. Display device **10**, upon receiving the predetermined signal, transmits an HPD signal of a predetermined logic level to the outside apparatus by way of the HPD line. The outside apparatus, upon receiving the HPD signal of the predetermined logic level, detects the connection with display device **10**. It is assumed hereinafter that the outside apparatus detects that display device **10** is connected when the logic level of the HPD signal is the High level.

Display device **10** includes scaler **11**, CPU (Central Processing Unit) **12**, power-supply control unit **13**, display unit **14**, switch circuits **15** and **16**, input acceptance unit **17**, and HPD control units **18a**, **18b**, **18c**, and **18d**. HPD control units **18a**, **18b**, **18c**, and **18d** are examples of the input control unit. In addition, CPU **12** is an example of the control unit. In the following explanation, HPD control units **18a**, **18b**, **18c**, and **18d** are referred to as HPD control unit **18** when they are not individually distinguished. In addition, outside apparatuses **2a** and **2b** are referred to as outside apparatuses **2** when not distinguished, and outside apparatuses **3a** and **3b** are referred to as outside apparatuses **3** when not distinguished.

Scaler **11** supplies one of the signals received as input from outside apparatuses **2** and **3** by way of switch circuits **15** and **16** (to be described) to display unit **14** as the picture signal that is the object of processing (object of display). Scaler **11** here performs resolution conversion of the picture signal that is the object of processing according to the resolution of display unit **14** and supplies the picture signal that follows conversion to display unit **14**. In the following explanation, scaler **11** is assumed to have two picture signal input terminals (not shown in FIG. **1**).

Scaler **11** has detection units **111** and **112** and switching circuit **113**.

Detection unit **111** detects the presence or absence of the input of a picture signal by way of one of the input terminals of scaler **11** and supplies the detection result to CPU **12**. Detection unit **112** detects the presence or absence of the input of a picture signal by way of the other input terminal of scaler **11** and supplies the detection result to CPU **12**.

Switching circuit **113** carries out switching of, from among the picture signals that are received as input by way of the two input terminals belonging to scaler **11**, the picture signal that is to be supplied as the display-object picture signal.

CPU **12** controls the overall operation of display device **10**. For example, upon the output of a detection result that indicates that a picture signal has been received as input from detection unit **111** or detection unit **112**, CPU **12** instructs power-supply control unit **13** to supply power to display unit **14**. CPU **12** further controls the operation (signal output) of switch circuits **15** and **16** in accordance

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with input to input acceptance unit **17** (to be described). CPU **12** further controls the operation of HPD control units **18a**, **18b**, **18c**, and **18d** in accordance with input to input acceptance unit **17**.

Power-supply control unit **13** supplies power to display unit **14** under the control of CPU **12**.

Display unit **14** receives the supply of power to operate, and displays a picture in accordance with the picture signal supplied from scaler **11**.

Switch circuit **15** has input terminals **15a** and **15b**. Outside apparatus **2a** is connected to input terminal **15a**, and outside apparatus **2b** is connected to input terminal **15b**. Switch circuit **15** selects input terminal **15a** or **15b** under the control of CPU **12** and supplies the picture signal that was received as input from the outside apparatus by way of the selected input terminal to scaler **11** (one of the input terminals belonging to scaler **11**).

Switch circuit **16** has input terminals **16a** and **16b**. Outside apparatus **3a** is connected to input terminal **16a** and outside apparatus **3b** is connected to input terminal **16b**. Switch circuit **16** selects input terminal **16a** or **16b** under the control of CPU **12** and supplies the picture signal that is received as input from the outside apparatus by way of the selected input terminal to scaler **11** (the other input terminal belonging to scaler **11**).

In this way, the provision of switch circuits **15** and **16** enables a number of outside apparatuses that is greater than the number of input terminals of scaler **11** to be connected to a display device and enables the switching and display of pictures that accord with picture signals received as input from each outside apparatus according to, for example, the operation of a user.

Input acceptance unit **17** receives operation input and supplies to CPU **12** a signal according to the operation that was accepted.

HPD control units **18a**, **18b**, **18c**, and **18d** are provided corresponding to input terminals **15a**, **15b**, **16a**, and **16b**, respectively. HPD control units **18** control the input of signals (picture signals) from outside apparatuses by way of the corresponding input terminals in accordance with the control of CPU **12**.

CPU **12**, switch circuits **15** and **16**, input acceptance unit **17**, and HPD control units **18a**, **18b**, **18c**, and **18d** make up signal input switching circuit **19**.

The operation of signal input switching circuit **19** is next described.

In the following explanation, it is assumed that outside apparatus **2a** is connected to input terminal **15a** of switch circuit **15** and outside apparatus **2b** is connected to input terminal **15b**, as shown in FIG. **1**. It is further assumed that outside apparatus **3a** is connected to input terminal **16a** of switch circuit **16** and outside apparatus **3b** is connected to input terminal **16b**.

It is further assumed that operation input that indicates that outside apparatus **2a** (input terminal **15a**) and outside apparatus **3a** (input terminal **16a**) are to be selected has been carried out by way of input acceptance unit **17**. In this case, CPU **12** causes switch circuit **15** to select input terminal **15a** and causes switch circuit **16** to select input terminal **16b**, as shown in FIG. **1**.

CPU **12** next instructs HPD control units **18a** and **18c** that correspond to the input terminals of the selected sides (input terminals **15a** and **16a**) to supply HPD signals of the High level (first logic level) that indicate that the connection with display device **10** is effective. CPU **12** further instructs HPD control units **18b** and **18d** that correspond to input terminals

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of the sides that were not selected (input terminals **15b** and **16b**) to supply HPD signals of the Low level (second logic level).

HPD control unit **18a** receives the instruction of CPU **12** and supplies a High-level HPD signal to outside apparatus **2a** by way of a cable. HPD control unit **18c** further receives the instruction of CPU **12** and supplies a High-level HPD signal to outside apparatus **3a** by way of a cable. Upon receiving the High-level HPD signals, outside apparatuses **2a** and **3a** detect that a connection has been made to display device **10** and begin the output of picture signals.

HPD control unit **18b** receives the instruction of CPU **12** and supplies a Low-level HPD signal to outside apparatus **2b** by way of a cable. HPD control unit **18d** further receives the instruction of CPU **12** and supplies a Low-level HPD signal to outside apparatus **3b** by way of a cable. Upon receiving the Low-level HPD signals, outside apparatuses **2b** and **3b** detect that they are not connected to display device **10** and thus do not supply picture signals. The lack of supply of picture signals from outside apparatuses **2b** and **3b** reduce the occurrence of crosstalk in switch circuits **15** and **16**, thereby allowing a reduction of the occurrence of malfunction arising from crosstalk.

Thus, according to the present exemplary embodiment, signal input switching circuit **19** includes switch circuits **15** and **16** that supply signals received as input by way of any input terminals selected from among a plurality of input terminals, and input acceptance unit **17**. In addition, signal input switching circuit **19** is further provided with HPD control units **18**, which are provided corresponding to each of input terminals (**15a**, **15b**, **16a**, and **16b**) belonging to each of switch circuits **15** and **16** and which control the input of signals from outside apparatuses by way of the corresponding input terminals, and CPU **12**. In accordance with the input to input acceptance unit **17**, CPU **12** causes each switch circuit to select any of the plurality of input terminals belonging to each switch circuit and to supply the signal that was received as input by way of the input terminal that was selected. CPU **12** further causes HPD control units **18** that correspond to input terminals that were not selected to not supply signals from outside apparatuses that are connected to the corresponding input terminals.

By preventing the supply of picture signals from outside apparatuses that are connected to input terminals that were not selected in switch circuits **15** and **16**, the occurrence of crosstalk in switch circuits **15** and **16** is reduced, and the occurrence of malfunctions caused by crosstalk can be reduced.

The use of circuits having a high capability of reducing the occurrence of crosstalk as switch circuits **15** and **16** enables a reduction of the occurrences of malfunctions that arise due to crosstalk. However, such circuits having a high capability for reducing the occurrence of crosstalk are typically expensive, and the use of these expensive circuits therefore leads to cost increases. According to the present invention, the occurrence of malfunctions arising due to crosstalk can be reduced without the use of expensive circuits.

Second Exemplary Embodiment

Interfaces for exchanging picture signals between outside apparatuses and a display device include DVI (Digital Visual Interfaces) or HDMI (High Definition Multimedia Interfaces) (registered trademark). In some cases, an outside apparatus that conforms to DVI and an outside apparatus that conforms to HDMI are connected to a display device,

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and in the second exemplary embodiment of the present invention, a display system is described that, by means of a simple device configuration, switches between pictures from signal sources even when connected to an outside apparatus that conforms to DVI and an outside apparatus that conforms to HDMI.

FIG. 2 shows the configuration of display system **1A** according to the present exemplary embodiment.

Display system **1A** shown in FIG. 2 includes outside apparatuses **2a**, **2b**, **2c**, and **2d**; outside apparatuses **3a** and **3b**; and display device **10A**.

Outside apparatuses **2a**, **2b**, **2c**, **2d**, **3a**, and **3b** are connected to display device **10A** by way of cables and are the signal sources that supply picture signals to display device **10A**. In the following description, outside apparatuses **2a**, **2b**, **2c**, and **2d** are assumed to conform to HDMI. In this case, each of outside apparatuses **2a**, **2b**, **2c** and **2d** has a picture signal output terminal, an output terminal of voltage +5V and an HPD terminal to which a control signal is applied as input from display device **10A**. Further, outside apparatuses **3a** and **3b** in the following description are assumed to conform to DVI. In this case, each of outside apparatuses **3a** and **3b** includes two terminals (DVI dual-link 1/2 and DVI dual-link 2/2) that supply picture signals, an output terminal of voltage +5V, and an input terminal that receives as input control signals from display device **10A**.

The configuration of display device **10A** is next described. In FIG. 2, constructions identical to FIG. 1 are given the same reference numbers and redundant description is omitted. In FIG. 2, moreover, description is also omitted regarding input acceptance unit that receives operation input.

Display device **10A** of the present exemplary embodiment differs from display device **10** of the first exemplary embodiment in that switch circuits **15** and **16** are deleted and switch circuits **201-204** are added. In addition, display device **10A** of the present exemplary embodiment differs from display device **10** of the first exemplary embodiment in that transistors (Tr) **209**, **211**, **213**, **216**, **218**, and **220**, resistors **210**, **212**, **215**, **217**, **219**, and **222**, and inverter circuits **214** and **221** have been added. In addition, display device **10A** of the present exemplary embodiment further differs from display device **10** of the first exemplary embodiment in that scaler **11** has been altered to scaler **11A** and CPU **12** has been altered to CPU **12A**. Scaler **11A** differs from scaler **11** in that detection units **111** and **112** have been deleted, and detection units **205-208** have been added.

Switch circuit **201** has two input terminals, the picture signal output terminal of outside apparatus **2a** being connected to one input terminal, and the picture signal output terminal (DVI dual-link 1/2) of outside apparatus **3a** being connected to the other input terminal. Under the control of CPU **12A**, switch circuit **201** selects either one of the two input terminals and supplies the picture signal that is applied as input from the outside apparatus by way of the selected input terminal to scaler **11A**.

Switch circuit **202** has two input terminals, the picture signal output terminal of outside apparatus **2b** being connected to one input terminal, and the picture signal output terminal (DVI dual-link 2/2) of outside apparatus **3a** being connected to the other input terminal. Under the control of CPU **12A**, switch circuit **202** selects either one of the two input terminals and supplies the picture signal that is received from the outside apparatus by way of the selected input terminal to scaler **11A**.

Switch circuit **203** has two input terminals, the picture signal output terminal of outside apparatus **2c** being connected to one input terminal, and the picture signal output

terminal (DVI dual-link 1/2) of outside apparatus **3b** being connected to the other input terminal. Under the control of CPU **12A**, switch circuit **203** selects either one of the two input terminals and supplies the picture signal that is received from the outside apparatus by way of the selected input terminal to scaler **11A**.

Switch circuit **204** has two input terminals, the picture signal output terminal of outside apparatus **2d** being connected to one input terminal, and the picture signal output terminal (DVI dual-link 2/2) of outside apparatus **3b** being connected to the other input terminal. Switch circuit **204** selects either one of the two input terminals under the control of CPU **12A** and supplies the picture signal applied as input from the outside apparatus by way of the selected input terminal to scaler **11A**.

For the sake of convenience in the following explanation, of the two input terminals belonging to each of switch circuits **201-204**, the input terminal that connects to the outside apparatus (outside apparatus **2**) that conforms to HDMI may be referred to as the L-side input terminal, and the input terminal that connects to the outside apparatus (outside apparatus **3**) that conforms to DVI may be referred to the H-side input terminal.

Transistor **209** has its base connected to CPU **12A**, its collector connected to both the output terminal of voltage +5V of outside apparatus **2a** by way of resistor **210** and the HPD terminal of outside apparatus **2a**, and its emitter connected to ground.

Transistor **211** has its base connected to CPU **12A**, its collector connected to both the output terminal of voltage +5V of outside apparatus **2b** by way of resistor **212** and the HPD terminal of outside apparatus **2b**, and its emitter connected to ground.

Transistor **213** has its base connected to CPU **12A** by way of inverter circuit **214**, its collector connected to both the output terminal of voltage +5V of outside apparatus **3a** by way of resistor **215** and the HPD terminal of outside apparatus **3a**, and its emitter connected to ground.

Transistor **216** has its base connected to CPU **12A**, its collector connected to both the output terminal of voltage +5V of outside apparatus **2c** by way of resistor **217** and the HPD terminal of outside apparatus **2c**, and its emitter connected to ground.

Transistor **218** has its base connected to CPU **12A**, its collector connected to both the output terminal of voltage +5V of outside apparatus **2d** by way of resistor **219** and the HPD terminal of outside apparatus **2d**, and its emitter connected to ground.

Transistor **220** has its base connected to CPU **12** by way of inverter circuit **221**, its collector connected to both the output terminal of voltage +5V of outside apparatus **3b** by way of resistor **222** and the HPD terminal of outside apparatus **3b**, and its emitter connected to ground.

Each of transistors **209**, **211**, **213**, **216**, **218**, and **220** is provided corresponding to an outside apparatus that is connected to display device **10A** and is equivalent to HPD control unit **18** in the first exemplary embodiment.

Detection unit **205** detects the presence or absence of the input of picture signals by way of switch circuit **201** and supplies the detection result to CPU **12A**. Detection unit **206** detects the presence or absence of the input of picture signals by way of switch circuit **203** and supplies the detection result to CPU **12A**. Detection unit **207** detects the presence or absence of the input of picture signals by way of switch circuit **202** and supplies the detection result to CPU **12A**. Detection unit **208** detects the presence or absence of the

input of picture signals by way of switch circuit **204** and supplies the detection result to CPU **12A**.

CPU **12A** controls the overall operation of display device **10A**. When a detection result is supplied from detection units **205-208** indicating that a picture signal is being received as input, CPU **12A** instructs power-supply control unit **13** to supply power to display unit **14**. In addition, CPU **12A** supplies control signals (hereinbelow referred to as HDMI/DVI signals) that control the operation of switch circuits **201-204** and transistors **209**, **211**, **213**, **216**, **218**, and **220** in accordance with the input to input acceptance unit (not shown in FIG. 2).

The operation of display device **10A** is next described with reference to the flow chart shown in FIG. 3.

CPU **12A** first selects HDMI or DVI in accordance with the operation input to the input acceptance unit (Step S 101).

Having selected HDMI, CPU **12A** supplies a Low-level HDMI/DVI signal (Step S 102).

When the Low-level HDMI/DVI signal has been supplied from CPU **12A**, each of switch circuits **201-204** selects the L-side input terminal, i.e., the input terminal that is connected to the picture signal output terminal of an outside apparatus that conforms to HDMI (Step S 103).

In addition, when the Low-level HDMI/DVI signal has been supplied from CPU **12A**, transistors **209**, **211**, **216**, and **218** turn OFF. In addition, transistors **213** and **220** receive as input signal in which the HDMI/DVI signal has been inverted by inverter circuits **214** and **221**, i.e., High-level signals. Accordingly, transistors **213** and **220** turn ON (Step S104).

When transistors **209**, **211**, **216**, and **218** turn OFF, voltage of +5V (High-level HPD signal) is applied to the HPD terminals of each of outside apparatuses **2a-2d**. As a result, outside apparatuses **2a-2d** detect that the connection with display device **10A** is working and begin the output of picture signals.

When transistors **213** and **220** turn ON, the HPD terminals of each of outside apparatuses **3a** and **3b** become the ground potential (Low-level HPD signals are received as input). As a result, outside apparatuses **3a** and **3b** detect that the connection with display device **10A** is not working and do not supply picture signals.

Accordingly, while picture signals are supplied from outside apparatuses **2a-2d** that conform to HDMI, picture signals from outside apparatuses **3a** and **3b** that conform to DVI are not supplied. As a result, the occurrence of crosstalk in switch circuits **201-204** is reduced, and the occurrence of malfunctions arising due to crosstalk can be decreased.

Upon selecting DVI, CPU **12A** supplies a High-level HDMI/DVI signal (Step S105).

When a High-level HDMI/DVI signal is supplied from CPU **12A**, each of switch circuits **201-204** selects an H-side input terminal, i.e., an input terminal that is connected to the picture signal output terminal of an outside apparatus that conforms to DVI (Step S106).

When a High-level HDMI/DVI signal is supplied from CPU **12A**, transistors **209**, **211**, **216**, and **218** turn ON. On the other hand, a signal in which the HDMI/DVI signal is inverted by inverter circuits **214** and **221**, i.e., a Low-level signal, is applied as input to each of transistors **213** and **220**. Accordingly, transistors **213** and **220** turn OFF (Step S107).

When transistors **209**, **211**, **216**, and **218** turn ON, the HPD terminals of each of outside apparatuses **2a-2d** become the ground potential (receive as input Low-level HPD signals). As a result, outside apparatuses **2a-2d** detect that the connection with display device **10A** is not working and do not supply picture signals.

When transistors **213** and **220** turn ON, voltage of +5V (High-level HDP signal) is applied as input to the HPD terminals of each of outside apparatuses **3a** and **3b**. As a result, outside apparatuses **3a** and **3b** detect that the connection with display device **10A** is working and begin the output of picture signals.

Accordingly, while picture signals from outside apparatuses **2a-2d** that conform to HDMI are no longer supplied, picture signals from outside apparatuses **3a** and **3b** that conform to DVI are supplied. As a result, the occurrence of crosstalk in switch circuits **201-204** is reduced, and the occurrence of malfunctions that arise due to crosstalk can be decreased.

In the present exemplary embodiment, a common signal (HDMI/DVI signal) was applied as input to each switch circuit and each transistor. As a result, the signal line for controlling each switch circuit and the signal line for controlling each transistor can be shared, and a simplification of the configuration of the device can therefore be achieved.

While preferred embodiments of the present invention have been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

What is claimed is:

1. A signal input switching circuit, comprising:
a plurality of switch circuits, each switch circuit including a plurality of input terminals to which signals are respectively applied as input from different signal sources, and said each switch circuit supplying as output thereof a signal that applied as input by way of an input terminal selected from among the plurality of input terminals;
input control units provided corresponding to each of the plurality of input terminals belonging to each of said plurality of switch circuits, each control unit controlling a presence of an input of signals from a signal source corresponding to the input terminal;
an input acceptance unit that accepts an operation input signal; and
a control unit that, in accordance with an input signal to said input acceptance unit, causes said each said switch circuit to select one of the plurality of input terminals belonging to that switch circuit, and to supply as an output signal thereof signals from the signal source as input by way of the selected input terminal, and that further causes said input control units corresponding to input terminals that were not selected by said operation input signal to control signal sources that are connected to the corresponding input terminals to not present signals.
2. The signal input switching circuit as set forth in claim 1, wherein said control unit causes an input control unit, corresponding to said input terminal that was selected to supply to the signal source that is connected to the corresponding input terminal, a signal of a first logic level indicating that a connection is working, and causes said input control units corresponding to said input terminals that were not selected to supply to signal sources connected to the corresponding input terminals a signal of a second logic level.
3. A display device, comprising:
the signal input switching circuit as set forth in claim 2;
switching circuits that supply as output any of signals that were supplied from each of said plurality of switch circuits; and
a display unit;

wherein:

said signals include picture signals; and
said display unit displays pictures in accordance with picture signals that were supplied from said switching circuits.

4. A display device, comprising:
the signal input switching circuit as set forth in claim 1;
switching circuits that supply as output any of signals that were supplied from each of said plurality of switch circuits; and
a display unit;

wherein:
said signals include picture signals; and
said display unit displays pictures in accordance with picture signals that were supplied from said switching circuits.

5. The display device as set forth in claim 4, further comprising:

a scaler that supplies one of the signals received as the input from the signal sources by the switch circuits to the display unit as a picture signal for display.

6. The display device as set forth in claim 5, wherein the scaler performs a resolution conversion of the picture signal according to a resolution of the display unit and supplies the picture signal that follows the conversion to the display unit.

7. The display device as set forth in claim 6, wherein the scaler comprises:

a first detection unit that detects a presence of an input of the picture signal by one of input terminals of the scaler and supplies a detection result to the control unit.

8. The display device as set forth in claim 7, wherein the scaler further comprises:

a second detection unit that detects a presence of an input of another picture signal by another input terminal of the scaler and supplies the detection result to the control unit.

9. The display device as set forth in claim 8, wherein the scaler further comprises:

a switching circuit that, from the picture signal and said another picture signal that are received to the scaler as input by the input terminal and said another input terminal, carries out switching of a picture signal that is to be supplied as a display-object picture signal.

10. The display device as set forth in claim 5, wherein a number of the signal sources is greater than a number of input terminals of the scaler.

11. The signal input switching circuit as set forth in claim 1, further comprising a first transistor comprising:

a base connected to the control unit;
a collector connected to output terminals of one of the signal sources; and
an emitter connected to ground.

12. The signal input switching circuit as set forth in claim 11, further comprising a second transistor comprising:

a base connected to the control unit by an inverter circuit;
a collector connected to output terminals of another one of the signal sources; and
an emitter connected to the ground.

13. The signal input switching circuit as set forth in claim 12, wherein, after a signal is supplied from the control unit, the first transistor turns OFF and the second transistor receives an input signal in which the signal supplied from the control unit is inverted by the inverter circuit, and the second transistor turns ON.

14. A method of controlling a signal input switching circuit provided with:

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a plurality of switch circuits each switch circuit including a plurality of input terminals to which signals are respectively applied as input from different signal sources by way of predetermined cables, each of said switch circuit supplying as an output thereof a signal that is received as input by way of an input terminal that is selected from among the plurality of input terminals;

input control units provided corresponding to each of the plurality of input terminals belonging to each of said plurality of switch circuits, and each control unit controlling a presence of an input of signals from a signal source corresponding to the input terminals; and

an input acceptance unit that accepts an operation input signal;

said method comprising:

in accordance with an input to said input acceptance unit, causing said each said switch circuit to select one of the plurality of input terminals belonging to that switch

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circuit, and to supply as an output thereof the signal that was received as input by way of the selected input terminal; and

causing said input control units corresponding to input terminals that were not selected by said operation input signal to control signal sources that are connected to the corresponding input terminals to not present signals to the corresponding input terminals.

15. The method of controlling a signal input switching circuit as set forth in claim **14**, further comprising:

causing said input control unit corresponding to an input terminal that was selected to supply, to a signal source that is connected to the corresponding input terminal, a signal of a first logic level that indicates that the connection is working, and causing said input control units corresponding to input terminals that were not selected to supply a signal of a second logic level to signal sources that are connected to the corresponding input terminals.

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